US Army Corps
of Engineers
Buffalo District

Final
Proposed Plan for Remediation

Authorized under the
Formerly Utilized Sites Remedial Action Program
(FUSRAP)

Painesville Site
Painesville, Ohio

Prepared by:
U.S. Army Corps of Engineers Buffalo District
Hazardous, Toxic, and Radiological Waste (HTRW)
Design District for Great Lakes and Ohio River Division

July 2005

UNITED STATES ARMY CORPS OF ENGINEERS
PROPOSED PLAN FOR THE PAINESVILLE SITE
PAINESVILLE, OHIO

This Proposed Plan for the remediation of the Painesville Site was prepared by the United States Army Corps of Engineers (USACE), under its authority to conduct the Formerly Utilized Sites Remedial Action Program (FUSRAP). On October 13, 1997, the Energy and Water Development Appropriations Act, 1998 was signed into law as Public Law 105-62. Pursuant to this law, FUSRAP was transferred from the Department of Energy (DOE) to the USACE. As a result of this transfer the responsibility for this project was transferred to USACE. The Energy and Water Development Appropriations Act for Fiscal Year 2000, Public Law 106-60, provides authority to USACE to conduct restoration work on FUSRAP Sites subject to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code (USC) 9601 et seq., as amended. Therefore, USACE is conducting this project in accordance with CERCLA.

USACE is addressing radiological contamination of the soil at the Painesville site, resulting from the use of radiologically contaminated scrap steel in magnesium production by the Diamond Magnesium Company (DMC), a former contractor to the Federal Government. This Proposed Plan explains USACE's recommendation, the Preferred Alternative, to address soils impacted by FUSRAP-related activities and associated constituents of concern (COCs) at the Painesville Site.

USACE reviewed the 2003 Remedial Investigation/Feasibility Study (RI/FS) Report and the 2005 Feasibility Study Addendum for the Painesville Site, and other relevant documents, and does hereby propose that the remedial action for the Painesville Site be the alternative designated as Alternative 3, Excavation and Offsite Disposal, described in this Proposed Plan. After evaluating this alternative pursuant to the criteria described in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300.430(e)(9)(iii), USACE considers it to be protective of human health and the environment and cost effective.

USACE invites members of the public to review the Proposed Plan and the supporting documents which further describe the conditions at the Painesville Site and the basis for this Proposed Plan. These documents may be found in the administrative record files for the Painesville Site available at the following locations:

USACE FUSRAP Public Information Center
1776 Niagara Street
Buffalo, NY 14207
(716) 879-4396
(800) 833-6390 and press "5" at the recorded message.

Fairport Public Library
335 Vine Street
Fairport Harbor, OH 44077
(440) 354-8191

Morley Library
184 Phelps Street
Painesville, OH 44077
(440) 352-3383

Members of the public who wish to comment on this proposed plan may submit their comments in writing to USACE at the following address:

U.S. Army Corps of Engineers
Buffalo District
FUSRAP Information Center
1776 Niagara Street
Buffalo, NY 14207

Please refer to this Proposed Plan or to the Painesville Site, in any comments. All comments will be reviewed and considered by USACE in making its final decision on remedial actions to be conducted at the Painesville Site. Comments should be submitted no later than 30 days after the date of this Proposed Plan.

After the close of the public comment period, USACE will review all public comments, as well as the information contained in the administrative record file for this site, and any new information developed or received during the course of this public comment period, in light of the requirements of CERCLA and the NCP. An authorized official of USACE will then make a final selection of the remedial action to be conducted at this site. This decision will be documented in a Record of Decision, which will be issued to the public, along with a response to all comments submitted regarding this Proposed Plan.

If there are any questions regarding the comment process, or the Proposed Plan, please direct them to the address noted above, or telephone (716) 879-4396 or (800) 833-6390.

Timothy B. Touchette
Lieutenant Colonel, Corps of Engineers
District Engineer

12 July, 2005

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ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
ALARA	As low as reasonably achievable
ANL	Argonne National Laboratory
ARAR	Applicable or relevant and appropriate requirement
bgs	Below ground surface
BNI	Bechtel National Incorporated
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Constituents of concern
cy	Cubic yards
DMC	Diamond Magnesium Company
DOE	Department of Energy
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological risk assessment
FS	Feasibility Study
FUSRAP	Formerly Utilized Sites Remedial Action Program
FSSP	Final Status Survey Plan
GSA	General Services Administration
HCl	Hydrochloric acid
HHRA	Human health risk assessment
LCPC	Lake County Planning Commission
LOOW	Lake Ontario Ordnance Works
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MED	Manhattan Engineering District
mrem/yr	millirem per year
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRC	Nuclear Regulatory Commission
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
ODH	Ohio Department of Health
Ohio EPA	Ohio Environmental Protection Agency
ORNL	Oak Ridge National Laboratory
PP	Proposed Plan
PRG	Preliminary Remediation Goal
Ra-226	Radium-226
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RESRAD	Residual Radiation
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision

SAIC	Science Applications International Corporation
SOR	Sum of ratios
TBC	To be considered
TEDE	Total effective dose equivalent
Th-230	Thorium-230
Th-232	Thorium-232
U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

Purpose

The Proposed Plan for the remediation of the Painesville Site was prepared by the United States Army Corps of Engineers (USACE), which is implementing the Formerly Utilized Sites Remediation Action Program (FUSRAP), under the authority and procedures of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

USACE is addressing radiological contamination of the soil at the Painesville site. This contamination results from the use of radiologically contaminated scrap steel in magnesium production by the Diamond Magnesium Company, a former contractor to the Federal Government.

This Proposed Plan explains USACE's recommendation, the Preferred Alternative, to address soils impacted by FUSRAP-related activities and associated constituents of concern (COCs) at the Painesville Site.

This Proposed Plan only addresses FUSRAP contamination on the site, and does not address other potential site contamination that cannot be addressed by USACE under its FUSRAP authority.

Site History

The Painesville FUSRAP Site is located in Painesville, Ohio, from which it derives its name. The Painesville Site was a former industrial facility, which began operations in 1942. The site, now essentially cleared, was formerly covered by many structures, such as process buildings, warehouses, office buildings, a chemical transfer facility, several above-ground storage tanks, building rubble piles, and a railroad spur. In recent years, the current property owner, Crompton Manufacturing Company, Inc., demolished all but one of the buildings.

The land surrounding the Painesville Site is primarily being used for active industrial purposes, or is property where former industrial facilities once existed and are now inactive. There are no residential areas immediately adjacent to the site, and the site poses no immediate risk to human health or the environment.

From 1942 to 1953, the Diamond Magnesium Company operated a magnesium production facility on the Painesville site for the General Services Administration (GSA). Between 1951 and 1953, the Diamond Magnesium Company received approximately 1,650 tons of radiologically contaminated scrap steel from the Lake Ontario Ordnance Works, to be used in their production process. The scrap steel was consumed in the magnesium production process; however, USACE

believes that soils at the site were contaminated while the scrap steel was in storage, prior to use.

Remediation Plan for Radiologically Contaminated Soils

USACE has identified four FUSRAP-related COCs in impacted soils (which include their associated decay products): radium-226, thorium-230, thorium-232, and total uranium. After investigating the site, examining the data collected, and determining that the most reasonable future use of the site is likely to be continued industrial use, USACE has concluded that these four COCs pose an unacceptable risk to human health to a site worker receptor under an industrial site use.

Within this Proposed Plan report, USACE profiles three remedial alternatives for the site. USACE's Preferred Alternative to remediate the impacted soils at the Painesville Site is Alternative 3: Excavation and Offsite Disposal. The cost of Alternative 3 is estimated to be approximately $5,297,000. Excavation and offsite disposal is considered to be the most protective in the long-term, and is a permanent remedy, as all soils exceeding the established cleanup levels will be removed from the Painesville Site. (The cleanup goals were developed so the total effective dose equivalent (TEDE) after remediation would not exceed 25 millirem per year (mrem/yr) for a construction worker receptor). USACE has estimated that the volume of soil exceeding the cleanup levels which will need to be removed is about 4,075 cubic yards (cy).

Further evaluations and explanations associated with the contents of this Proposed Plan are contained in the Remedial Investigation/Feasibility Study Report (USACE 2003) and the Feasibility Study Addendum (USACE 2005). These and other documents regarding the Painesville site comprise the administrative record file at the Public Information center at the Buffalo District USACE Office, the Fairport Harbor Public Library, and the Morley Library in Painesville.

Public Comment

The public is encouraged to review and comment on all of the alternatives identified in this report, especially the selection of the Preferred Alternative. USACE may modify the preferred alternative or select another alternative presented in this Proposed Plan based on new information or public and/or regulatory agency comments.

Comments on this proposed remedial action at the Painesville site will be accepted for 30 days following issuance of the Proposed Plan in accordance with CERCLA. A public meeting will be conducted during the comment period to receive verbal comments from the public. Responses to the public comments and the final remedy selected for the Painesville Site will be documented in the

Record of Decision (ROD) that will be published after all comments are addressed.

All written comments should be addressed to:

U.S. Army Corps of Engineers
Buffalo District
FUSRAP Information Center
1776 Niagara Street
Buffalo, NY 14207

1.0 INTRODUCTION

This Proposed Plan (PP) for the Painesville Site was prepared by the United States Army Corps of Engineers (USACE) under its authority to conduct the Formerly Utilized Sites Remediation Action Program (FUSRAP). FUSRAP was initiated by the Atomic Energy Commission (AEC) in 1974 to identify, assess, and clean up sites with residual radioactive contamination resulting from the early years of the nation's atomic weapons program. Management of FUSRAP was transferred from the Department of Energy (DOE) to USACE in October 1997. The USACE is issuing this Proposed Plan as part of its public participation responsibilities under the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code Section 9601 et seq., as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 CFR § 300.430(f) (2). This plan addresses only the constituents associated with radiologically contaminated scrap steel used in magnesium production by the Diamond Magnesium Company, a former contractor to the Federal Government, as those are the only potential constituents associated with former AEC activities. This document presents the three remedial alternatives considered by USACE, USACE's Preferred Alternative, and rationale concerning how best to address the contamination at the Painesville Site.

Two key documents associated with this Proposed Plan are the Remedial Investigation/Feasibility Study (RI/FS) Report (USACE 2003), and the Feasibility Study Addendum (USACE 2005). The Remedial Investigation/Feasibility Study Report describes the nature and extent of contaminants; and how the remedial alternatives discussed in this Proposed Plan were developed and evaluated. The Feasibility Study Addendum amends the remedial alternatives first presented in the Remedial Investigation/Feasibility Study Report. Information also is taken from the Baseline Risk Assessment (BRA) contained in the Remedial Investigation/Feasibility Study Report, which assesses risks to public health and the environment posed by FUSRAP-related contaminants in the environmental media at the site.

The Remedial Investigation/Feasibility Study Report and other documents regarding the Painesville site are contained in the administrative record file at the Public Information Center at the Buffalo District USACE Office, the Fairport Public Library, and the Morley Library in Painesville. The USACE encourages the public to review all available material about the Painesville site to gain a more comprehensive understanding of the site and FUSRAP activities that have been conducted at the Painesville site.

The final remedy decision will be documented in the Record of Decision (ROD). USACE may modify the preferred alternative or select another alternative presented in this Proposed Plan based on new information or public and/or

regulatory agency comments. Thus, the public is encouraged to review and comment on all of the alternatives identified herein.

This Proposed Plan only addresses FUSRAP contamination on the site, and does not address other potential site contamination that is not eligible for response under FUSRAP.

2.0 SITE BACKGROUND

2.1 Site Location

The Painesville FUSRAP Site is located at 720 Fairport-Nursery Road in Painesville, Ohio, approximately 35.4 kilometers (km) [22 miles (mi)] northeast of Cleveland. Figure 1 shows the site's proximity to the surrounding area. The site is currently owned by the Crompton Manufacturing Company, Inc. Manufacturing Company, Inc. (formerly the Uniroyal Chemical Company). The Painesville FUSRAP Site is bounded on the north by the Norfolk and Southern Railroad, on the west by property owned by Crompton Manufacturing Company, Inc., on the south by Fairport Nursery Road, and on the east by Twin Rivers Technologies (formerly Lonza, Inc.). Active and inactive industrial properties immediately surround the Painesville Site. Painesville Township Park lies north of the site, the Diamond Alkali Waste Lake hazardous waste site is located to the south, and residential properties are to the northeast. The Grand River is located approximately 0.2 km (0.1 mi) southwest of Fairport Nursery Road, and flows in a northwesterly direction towards Lake Erie. Figure 2 shows the Painesville FUSRAP Site and adjoining properties.

2.2 Site History

In the early 1940s, the Defense Plant Corporation financed construction of a magnesium production facility in Painesville, Ohio, on property acquired by the Federal Government. In support of the World War II effort and later government operations, the Diamond Magnesium Company operated this facility from 1942 to 1953 for the General Services Administration (GSA). In 1963, the GSA sold the plant to the U.S. Rubber Company, which later became the Uniroyal Chemical Company, and is now the Crompton Manufacturing Company, Inc. Figure 3 shows the former Diamond Magnesium Company site plan, and Figure 4 shows the layout of the Painesville Site as it appeared during Uniroyal operations.

There is no known history of processing or production of radioactive materials at the Painesville FUSRAP Site. The radioactivity present at the site resulted from the use of scrap ferrous metal to scrub chlorine gas released during the magnesium production process. The GSA sought such scrap metal from the AEC inventories at the Lake Ontario Ordnance Works (LOOW) in Niagara Falls, New York. By the early 1950s, LOOW had accumulated significant quantities of scrap metal, in part because metal drums were used to ship and store residues from the processing of pitchblende ores. When the pitchblende residues were consolidated into a storage facility at LOOW, the emptied drums were cleaned for reuse or scrapped. These drums, which contained observable residues of pitchblende ores, were part of the scrap shipped to the Painesville FUSRAP Site (ORNL 1991). The radionuclides associated with the pitchblende residues (primarily radium, thorium and uranium) and their naturally occurring decay products are considered FUSRAP related.

Approximately 1,650 tons of scrap metal was shipped to the Painesville FUSRAP Site. These shipments occurred between July 1952 and April 1953. The scrap metal was delivered by railroad to the western side of the property where it was stored on the ground with no cover. Former employees indicated an additional delivery route was also present on the eastern side of the buildings, where scrap was moved from the west railroad siding to the east siding by sliding uncovered rail-sided wooden skids or sheds pulled by a tractor (Eddington 1996). In a recent interview with a former plant manager he indicated that scrap was off loaded from both east and west spurs and was moved via rail car from one siding to another (Trumbel 2001). From the eastern side, the scrap metal was either immediately added to the hydrochloric acid (HCl) digester tanks or stored on the ground (ORNL 1990).

The scrap metal used to scrub chlorine gas was immersed into weak HCl for complete digestion. Liquid acid waste from the process was discharged directly into the Grand River until June 1952, at which time the discharge was redirected across the Grand River into a waste pond owned by the Diamond Alkali Company.

A letter from C. D. Williams, GSA, to J. S. Quidor, AEC, dated October 9, 1951, states: “Sludge composed of ferrous chlorides and other wastes resulting from the acid reaction is dumped onto waste beds as refuse having no useful value. Any radioactive particles of low intensity would be distributed within the sludge and eventually buried within the waste pond” (Williams 1951). However, it is unclear if any other locations were actually used to dispose of sludge produced by the acid digestion process, as no other references to sludge disposal have been found.

Because the constituents of concern (COCs) in the scrap metal were related to AEC activities, Oak Ridge National Laboratory (ORNL) conducted a preliminary and limited radiological survey in 1988 to determine whether the site met the current radiological guidelines. The findings from this survey indicated that residual radioactivity was present at the site above existing guidelines for unrestricted use (ORNL 1990, 1991). The principal radiological COCs were determined to be uranium-238 (U-238), radium-226 (Ra-226), thorium-230 (Th-230) and their naturally occurring decay products. Based on these initial surveys, the site was designated by the DOE as a FUSRAP site for further evaluation and remedial action, as appropriate (DOE 1992). As discussed earlier the authorization for remedial action at the site only includes FUSRAP related constituents.

2.3 Previous FUSRAP Activities

Prior to the Remedial Investigation/Feasibility Study, several other investigations were performed at the Painesville Site. A summary is provided below and more

detailed information can be found in the Remedial Investigation/Feasibility Study Report (USACE 2003).

On October 10 and 11, 1988, ORNL performed a preliminary site evaluation of the Crompton Manufacturing Company, Inc., property. ORNL performed a gamma walkover survey over the study area and collected soil samples for radiological analysis. During the survey, information was obtained concerning other portions of the property, which would need to be addressed as part of future efforts (ORNL 1990).

ORNL returned to the site in September 1990 to examine the property to the east (owned by Twin Rivers Technologies) adjacent to the railroad tracks, and to investigate areas that showed elevated gamma readings during the 1988 survey. The survey results (ORNL 1991) indicated that elevated concentrations of radionuclides were found in both surface and subsurface soil in excess of DOE guidelines for release of a property without radiological restrictions. The primary COCs were U-238, Th-230, and Ra-226 with activity levels as high as 76 pCi/g, 310 pCi/g, and 1,500 pCi/g, respectively.

In 1996, Bechtel National Incorporated (BNI), Science Applications International Corporation (SAIC) and Argonne National Laboratory (ANL), under contract to DOE, performed a detailed investigation of the Painesville FUSRAP Site area. This investigation included ambient air sampling, external gamma rate exposure measurements, building radiological surveys, gamma walkover surveys, groundwater sampling, surface geophysical surveys, surface water sampling, sediment sampling, ecological sampling, and soil sampling. The results of this study are documented in the Characterization Report for the Painesville Site (USACE 1998a).

In 1998, the U.S. Army Corps of Engineers completed an Engineering Evaluation/Cost Analysis (EE/CA) to support a removal action at the site. The EE/CA developed cleanup goals and evaluated several alternatives for addressing the radiological contamination at the site. The selected alternative was documented in an Action Memorandum, and the removal action was then conducted in the fall of 1998. Slightly more than 1,300 cubic yards (cy) were removed before the project was suspended due to the onset of winter conditions, and the discovery that the extent of contamination was greater than anticipated in the Action Memorandum. During the removal action samples were collected from soil that remained in place in the excavated area after removal was completed. These samples indicated that radiological contamination above the cleanup goals still existed below the limit of excavation (USACE 1999).

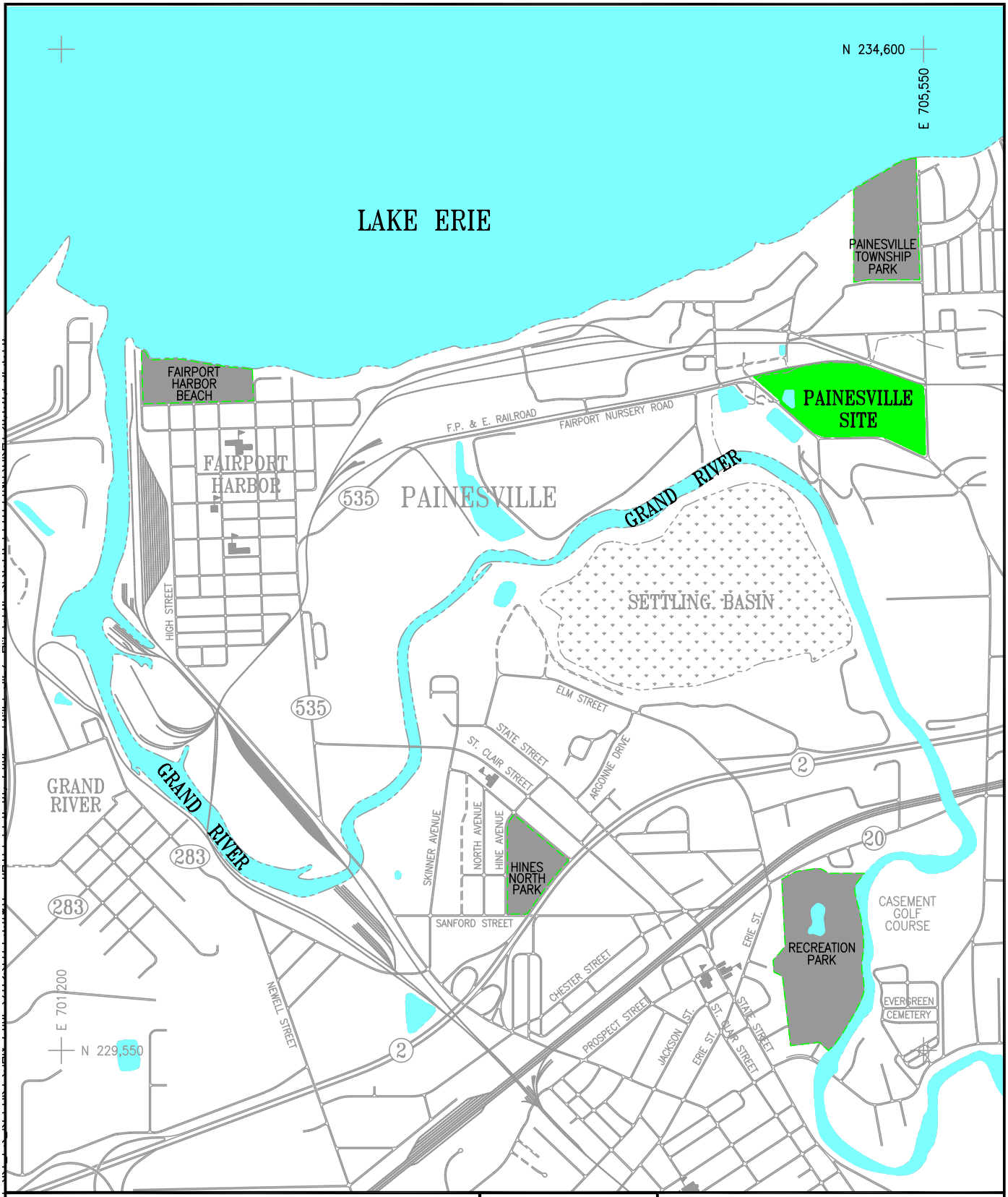
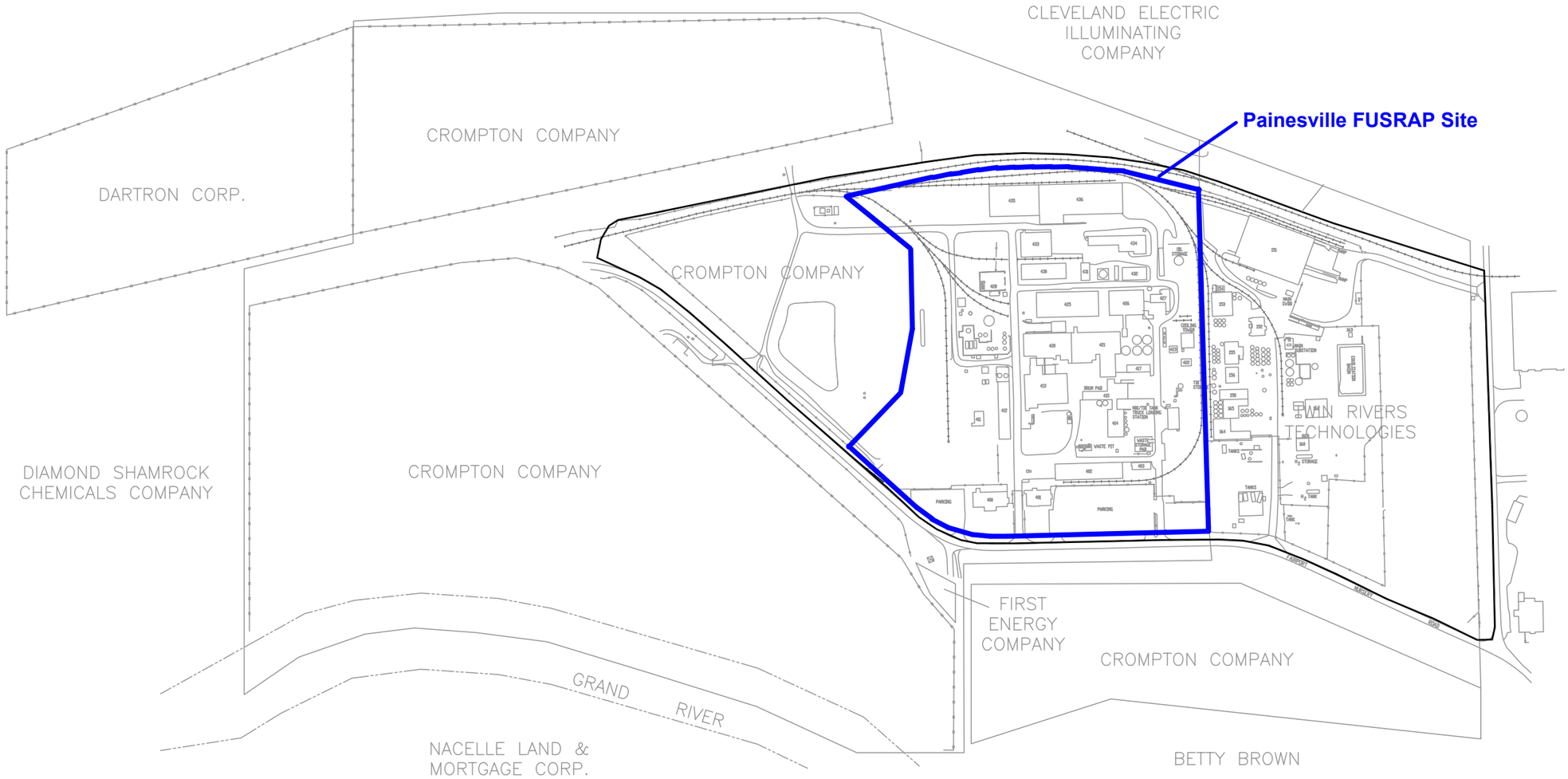


Figure 1: Painesville FUSRAP Site in Relation to the Surrounding Area

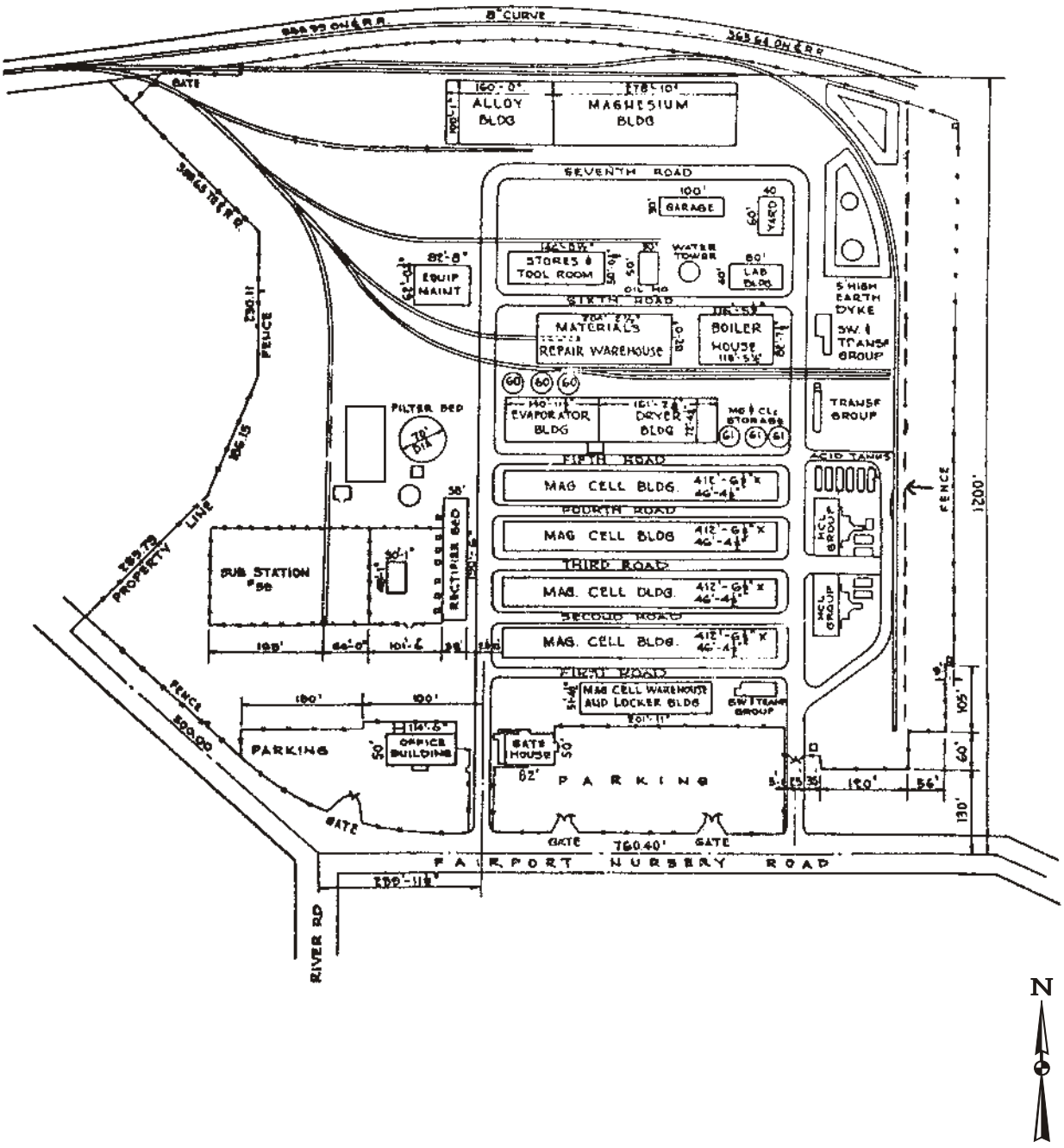


PAINESVILLE FUSRAP SITE
PROPERTY BOUNDARY
FENCE LINE
RAILROAD
RIVER BOUNDARY

N
True North

200 0 200 400
FEET

Figure 2: Painesville FUSRAP Site and Adjoining Properties



Legend

100 0 100 200 300

SCALE IN FE

Figure 3: Former Diamond Magnesium Company Site Plan

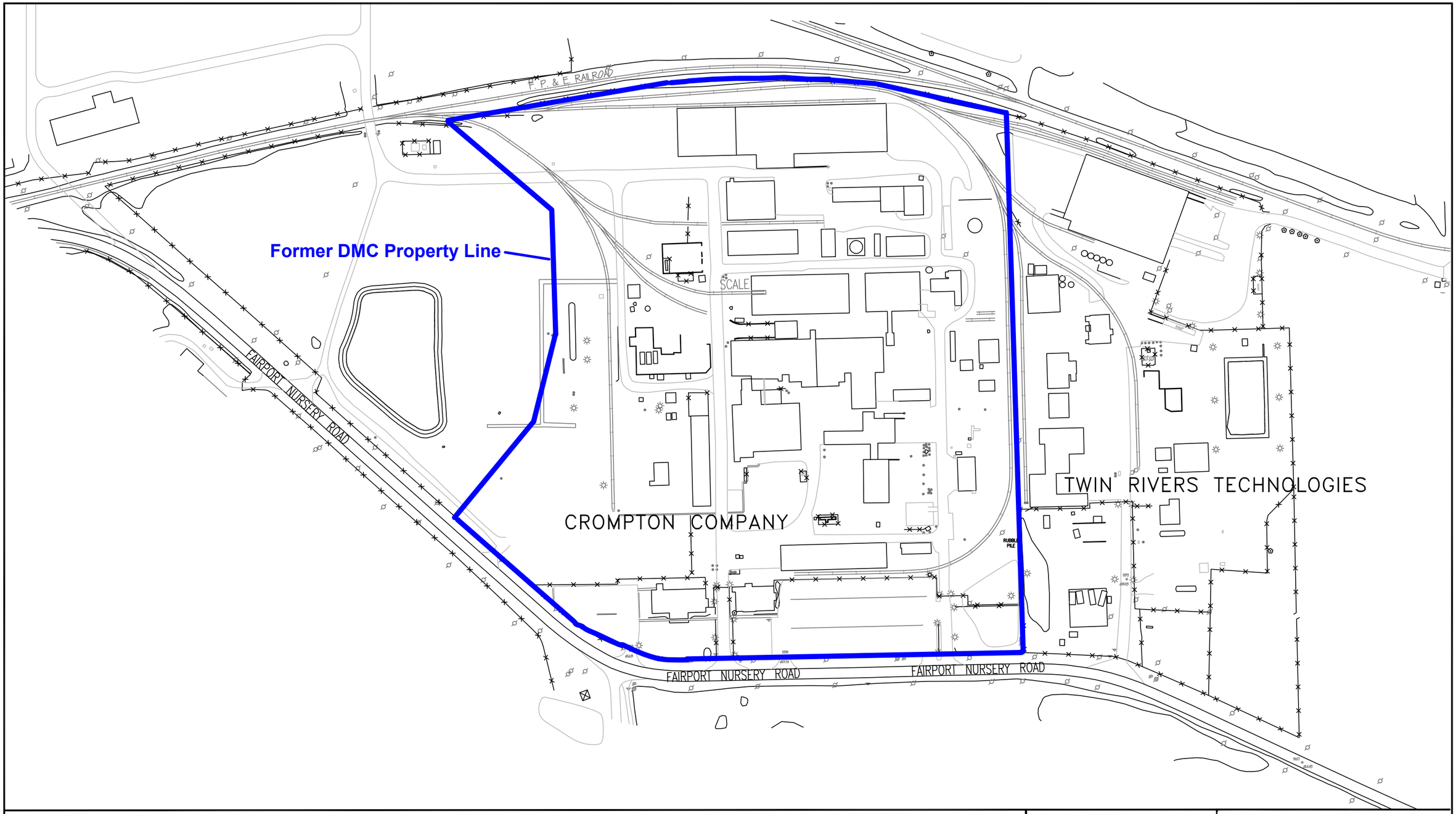


Figure 4: Painesville FUSRAP Site During Uniroyal/Lonza Operations

3.0 SITE CHARACTERIZATION

3.1 Site Description

The Painesville FUSRAP Site is located in Lake County, Ohio, approximately 1.5 miles north of the City of Painesville. The City of Painesville has a population of approximately 16,000 (LCPC 1990b). The area immediately surrounding the Painesville FUSRAP Site, as well as a large portion of the Painesville Township in Lake County, is zoned as a heavy industrial area. However, there are recreational and residential areas nearby. South of the Painesville FUSRAP Site, a vacant lot in the northern portion of the City of Painesville is in the city plan as a future recreational area or golf course (NPD 1993). Painesville Township Park borders Lake Erie and lies approximately one-half mile north of the site area. Although there are some tree nurseries nearby, there is no agriculture in the area.

The Painesville FUSRAP Site is approximately 30 acres in size and has very little topographic relief. The maximum elevation change across the site is less than 3 meters (m) (10 feet [ft]). The ground surface of the site is primarily covered with a mix of asphalt, concrete, and building rubble. Process buildings, warehouses, office buildings, a chemical transfer facility, several aboveground storage tanks, building rubble piles, and a railroad spur formerly covered the site (Figure 3).

There are no surface water features on the Painesville FUSRAP Site. Surface water features near the Painesville FUSRAP Site include the Grand River, located approximately 0.2 kilometers (km) (0.1 miles [mi]) southwest of the Fairport-Nursery Road, a waste pond (which was constructed subsequent to Diamond Magnesium Company activities) located between Fairport-Nursery Road and the Grand River, a waste pond on the Twin Rivers Technologies property, and Lake Erie, located approximately 2 km (1.2 mi) due north of the site. The Grand River empties into Lake Erie at Fairport Harbor, which is located 3 km (1.8 mi) west of the site.

An extensive storm water sewer drainage system is present on the site where the ground surface is primarily covered by concrete, asphalt, or is under roof. In these areas, surface water is quickly captured by the drainage system and ultimately discharged to the Grand River. Rainfall that does not result in runoff initially percolates through the upper few feet of fill material. The water accumulates at the upper surface of the natural soil, which is relatively impermeable due to its high clay content. Surface water runoff resulting from storm events is captured by the storm sewer system.

3.2 Geology and Hydrogeology

The geology of the Painesville FUSRAP Site is relatively simple. A blanket of fine-grained till with some localized fill on top overlies bedrock. The uppermost

bedrock unit underlying the site is the Chagrin Shale Formation (Schmidt 1988). In this area the Chagrin Shale is approximately 300m (1000 ft.) thick (USACE 1998a). Bedrock was not encountered in any of the boreholes, drilled to a maximum depth of 12 m (40 ft) during characterization.

The Ashtabula Till, a nonlithified till deposited in the late Woodfordian Age of the Wisconsinan glaciation during the Pleistocene Epoch, lies disconformably above the Chagrin Shale. The till was observed to have a high clay and silt content with a few sand- and gravel-sized, dark gray, shale fragments. Located above the native till at the site is a layer of disturbed/fill material, ranging from 0.0 to 6.2 m (0.0 to 20.5 ft) in thickness. The fill consists of a wide variety of material: disturbed native till, black coal slag and fly ash, white granular polyvinyl chloride, red bricks, concrete, sand and gravel, plastic, cloth, glass, and metal.

Elevation data collected from shallow piezometers and temporary monitoring wells suggest that perched groundwater occurs near the surface across much of the site, but is discontinuous and shallow. It appears that perched groundwater in the upper fill layer is pooling in topographic depressions on top of the natural clay formation. The results from drilling activities determined that the regional groundwater table is at a depth greater than 12 m (40 ft) below the ground surface. The perched groundwater observed in the piezometers and temporary monitoring wells is very cloudy to turbid in nature and does not represent a potential drinking water source.

Groundwater yields from the water table in the bedrock are usually only adequate for domestic use. Stout et al. (1943) report that the Chagrin Formation underlying the Painesville area yields little or no water. Sulfur water or brine is often encountered during deep drilling operations.

Lake Erie is the water source for the majority of the local population. Information supplied by Ohio EPA indicates that there are no domestic users of groundwater in the vicinity of the site.

3.3 Constituents of Concern

The Remedial Investigation/Feasibility Study identified site features, assessed the nature and extent of constituents, evaluated risks to human health and the environment, and developed remedial alternatives to address constituents associated with AEC-related activities at the Painesville Site. This Proposed Plan discusses constituents of concern associated with AEC-related activities. USACE has identified four AEC-related COCs at the Painesville Site: radium-226 (and its decay products), thorium-230, thorium-232 (and its decay products), and total uranium. Hereafter, references to COCs in this document will pertain to these AEC-related constituents.

Radium is a naturally occurring element, found in small concentrations in soil, rocks, surface water, groundwater, plants and animals. Radium can be ingested or inhaled, and although much of the radium is excreted from the body, some of it may remain in the bloodstream or lungs and be carried throughout the body. Radium also is a source of radon gas, and exposure to radon is known to cause bone and lung cancer.

Thorium is a naturally occurring element, found in soil, rocks, surface water, groundwater, and plants. Thorium can be ingested or inhaled, and can cause lung, pancreatic, and hematopoietic cancers. Thorium is also known to attach to the skeletal system and cause bone cancer.

Uranium is also a naturally occurring element, found naturally throughout the world in soils, geologic formations, water, animals and even some natural foods. As with the other COCs, uranium can be ingested or inhaled. The most prevalent human health concerns of uranium exposure occur through ingestion and can lead to bone cancer and kidney damage.

3.4 Impacted Soils

On-site soils were investigated, focusing on features known or believed to have been impacted by past AEC-related activities at the site. Brief summaries of these features are provided below. Table 1 presents the minimum and maximum detected concentrations of the COCs in each area of concern. More detailed information is available in the Remedial Investigation/Feasibility Study (USACE 2003) and Feasibility Study Addendum (USACE 2005).

The total volume of soil exceeding cleanup goals is estimated at up to 4,075 cubic yards (cy). This volume is based on the cleanup goals presented in Section 6.3 and Table 2. Figure 5 presents the extent of impacted soils to be excavated.

Area A:

Area A corresponds to the location where the radiologically contaminated scrap steel was apparently stored on the site prior to its use. Area A was also the area where the Removal Action was conducted in 1998. Radionuclides radium-226, thorium-230 and uranium-238 were the COCs most commonly detected above background in soil samples collected from this area. Area A is approximately 13,518 square feet in size, and extends to a maximum depth of 10 feet. The volume of contaminated soil in Area A is approximately 2,251 cy.

Area C:

Area C corresponds to the former location of the acid digester tanks, into which the radiologically contaminated scrap steel was immersed as part of the chlorine scrubbing process. Radionuclides radium-226, thorium-230 and uranium-238 were the COCs most commonly detected above background in soil samples

collected from this area. Area C is approximately 15,399 square feet in size, and extends to a maximum depth of 4 feet. The volume of contaminated soil in Area C is approximately 1,267 cy.

Areas B, D, and G:

Areas B, D and G were areas identified during the 1996 site-wide gamma walkover survey as having elevated levels of radioactivity. Subsequent soil sampling found levels of radium-226, thorium-230 and uranium-238 above background. Area B is approximately 1,080 square feet in size, and extends to a maximum depth of 2 feet. Area D is approximately 3,591 square feet in size, and extends to a maximum depth of 1 feet. Area G is approximately 1,935 square feet in size, and extends to a maximum depth of 0.5 feet. The contaminated soil volumes for Areas B, D and G are 67 cy, 125 cy, and 36 cy, respectively.

Rubble Pile:

The Rubble Pile is located in the southeast corner of the site, and consists of soil and construction debris from the excavation of foundations in the vicinity of the former acid digesters. Radionuclides radium-226, thorium-230 and uranium-238 were the COCs most commonly detected above background in soil samples collected from this area. The contaminated area in the rubble pile is approximately 5,094 square feet in size, and extends to a maximum depth of 3 feet. The volume of contaminated soil in the Rubble Pile is approximately 331 cy.

Table 1: Constituents of Concern

COC	Area A		Area B		Area C		Area D		Area G		Rubble Pile	
	Min (pCi/g)	Max (pCi/g)	Min (pCi/g)	Max (pCi/g)	Min (pCi/g)	Max (pCi/g)	Min (pCi/g)	Max (pCi/g)	Min (pCi/g)	Max (pCi/g)	Min (pCi/g)	Max (pCi/g)
Ra-226	0.67	862	0.82	10.64	0.61	285.05	0.38	14.76	0.49	22.4	0.64	75.78
Th-230	0.65	422	1.16	10.47	1.03	311.8	1.58	20.7	0.97	13.5	1.22	79.04
Th-232	0.13	9.34	0.51	1.39	0.27	3	0.36	2.58	0.39	2.35	0.76	15.95
U-234	0.87	294.8	2.07	8.33	1.2	381.8	2.33	5.53	2.67	3.71	1.31	21.23
U-235	0.11	9.87	0.13	1.62	0.08	42.22	0.09	0.83	0.15	2.21	0.11	1.33
U-238	0.65	282.7	1.92	8.35	1.56	320.2	2.13	5.32	2	12.12	1.31	21.96

NA = This COC was not analyzed for.

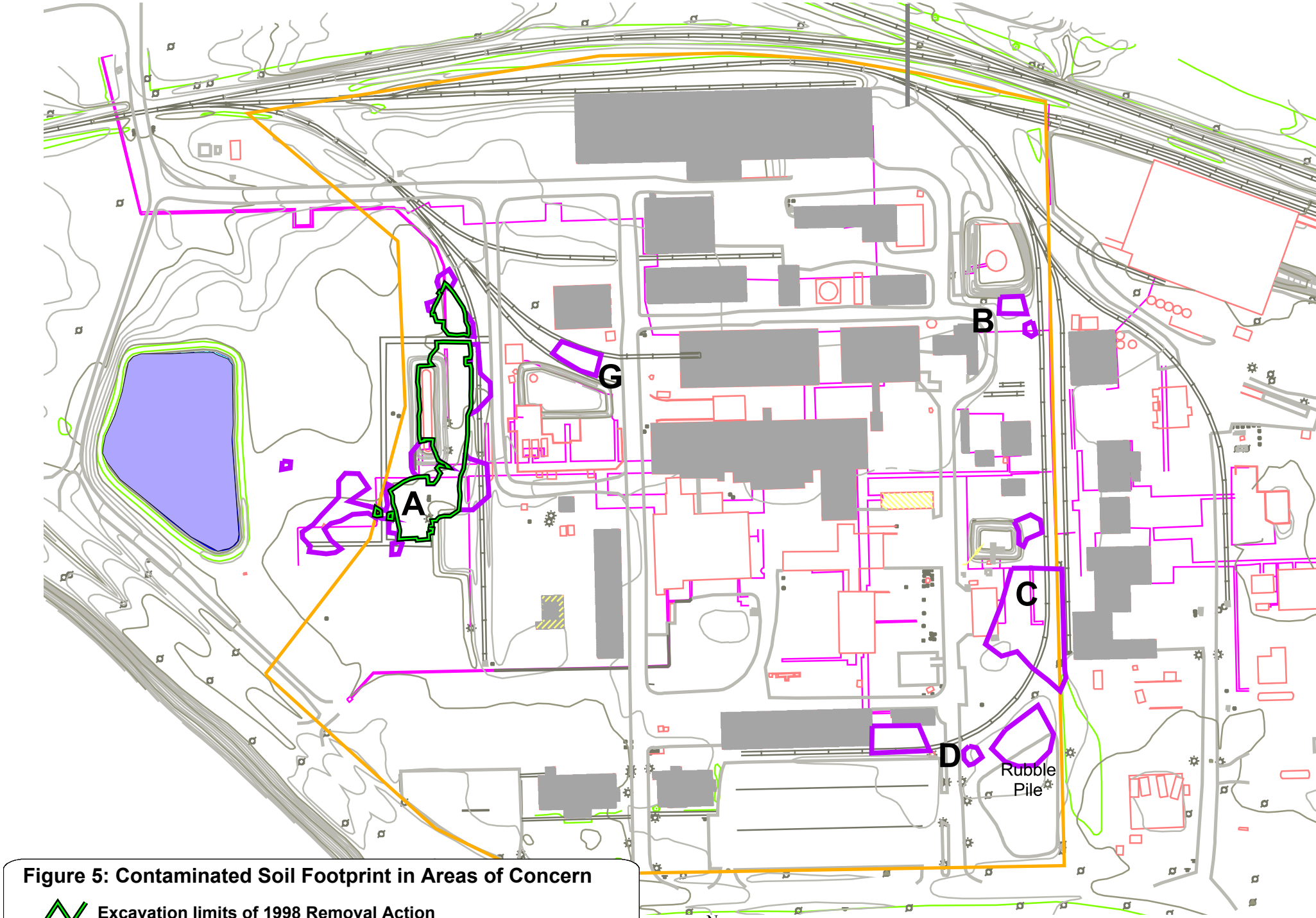


Figure 5: Contaminated Soil Footprint in Areas of Concern

- Excavation limits of 1998 Removal Action
- Soil above construction worker cleanup levels
- FUSRAP site boundary

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

This response action will address impacted soils at the Painesville site. Under FUSRAP, USACE is authorized to remediate only those COCs originating from AEC-related activities. At the Painesville site, these COCs include radioactive residuals only. Constituents not associated with AEC activities may be remediated only if mixed with AEC-related COCs. If these constituents are co-mingled with AEC-related COCs, they will be remediated and addressed in terms of proper disposal and other actions. The scope of this response action addresses the following constituents: radium, thorium, and uranium in soils.

The reasonable future use of a site must be considered when developing alternatives for addressing site contamination. The Painesville Site has been an industrial site since the early 1940s, and is currently zoned as industrial. The Painesville Site is surrounded by active and inactive industrial properties, including an active facility, Twin Rivers Technologies, immediately adjacent to the site. Soils at the site are poorly suited for agricultural purposes, as native soils are high in clay content, and a layer of miscellaneous fill exists over much of the site. Groundwater supplies at the site are low in quantity and of low quality for drinking purposes. Finally, the site property owner, Crompton Manufacturing Company, Inc., is conducting chemical cleanup activities at the site and adjacent properties, which include capping of landfills and lagoons, restricting potential future residential development or construction on these areas. Therefore, USACE has determined that the reasonable expected future site use of the Painesville Site is industrial.

5.0 SUMMARY OF SITE RISKS

The Baseline Risk Assessment (BRA) portion of the RI (USACE 2003) provides a quantitative estimate of potential risks to human health and the environment from radiological constituents at the Painesville site. The purpose of the risk assessment was to determine the need for cleanup and provide a baseline to compare remedial alternatives. The human health risk assessment (HHRA) and the ecological risk assessment (ERA) were conducted according to the methodology presented by the EPA in the *Risk Assessment Guidance for Superfund* (RAGS) (EPA 1989) and other guidance documents. A brief summary of the radiological human health risks, as well as the ecological risks is provided herein.

The BRA only evaluated radiological constituents in soils, as the site characterization indicated that soil was the only media impacted by FUSRAP contaminants (USACE 2003). Each area of concern identified in the site characterization was evaluated as a separate unit. An industrial worker receptor was evaluated as the reasonably anticipated future land use, because the site was a former industrial facility, is currently zoned industrial, and is surrounded by active and inactive industrial properties. There was no information identified during the Remedial Investigation/Feasibility Study that would lead to a conclusion that the reasonable future land use should be changed from the current use of industrial.

As the lead agency, it is USACE's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

5.1 Human Health Risk Assessment

The HHRA for radiological constituents utilized the RESidual RADiation (RESRAD) computer code Version 6.2. RESRAD, following the RAGS methodology, calculates the total excess cancer risk (i.e., the risk of persons developing cancer as the result of exposure to site contaminants) from radiological constituents to a particular receptor, for all applicable exposure pathways. Input parameters are selected to model a hypothetical human user of the site, or receptor, such as an industrial worker. Risk estimates were calculated covering a 1,000 year period, to be consistent with the applicable or relevant and appropriate requirements (ARARs) identified in Section 6.0 of this document. The maximum risk over this period was then compared to the acceptable risk range specified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (EPA 1990) of 10^{-6} to 10^{-4} (or one in 1,000,000 to one in 10,000). Constituents of concern (COCs) were conservatively identified as those individual radionuclides that contribute a single-pathway risk greater than 10^{-6}.

Risk for the industrial worker scenario was evaluated for exposure to surface soil (0-2 feet below ground surface (bgs)) through incidental soil ingestion, inhalation of dust, and direct external gamma exposure. Total excess cancer risk for the industrial worker receptor ranged from $1.4x10^{-4}$ for Area B, to $2.1x10^{-3}$ for the Rubble Pile. Because these risk values are above the acceptable risk range of 10^{-6} to 10^{-4}, action is required to ensure protection of human health and the environment for the anticipated future site use.

5.2 Ecological Risk Assessment

The screening ecological risk assessment showed that none of the organisms evaluated were at risk due to radionuclides regardless of habitat. When habitat considerations are added to the analysis, then the Painesville exposure units or habitat patches were found to have limited ecological attraction to wildlife because of small size and limited or no cover. In summary, most ecological resources at Painesville are rather limited, and there is no predicted risk from radionuclides. Addressing the risks to human health in soils will consequently reduce risks to ecological receptors.

6.0 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) specify the requirements that remedial alternatives must fulfill in order to protect human health and the environment from contaminants. Essentially, they provide the basis for identifying and evaluating remedial alternatives. The RAOs for the Painesville site are intended to provide long-term protection of human health and the environment. In order to provide this protection, media-specific objectives that identify major contaminants and associated media-specific cleanup goals are developed. These objectives specify the COCs, the exposure routes and receptors, and an acceptable maximum contaminant level for the long-term protection of receptors.

Remedial Action Objectives are statements that set forth a general description of what the remedial action will accomplish. RAOs should specify contaminants and media of concern, potential exposure pathways, and remediation goals. The first step in developing RAOs is to establish preliminary remediation goals (PRGs). PRGs are a subset of RAOs that set forth a more specific statement of the desired endpoint concentrations or risk levels. PRGs are initially based on readily-available information, such as chemical-specific ARARs or other reliable information. PRGs should be modified, as necessary, as more information becomes available during the Remedial Investigation/Feasibility Study. Final remediation goals will be determined when the remedy is selected.

6.1 Identification of Remedial Action Objectives

The results of the remedial investigation indicate that localized areas of soil at the Painesville site are contaminated with radium, uranium and thorium at concentrations that present risk to current and potential future land users. The RAOs for the site have been developed to specify the requirements that the remedial action alternatives must fulfill to protect human health and the environment from exposure to contaminants identified at the site. The RAOs for protecting human and ecological receptors will consider both the contaminant concentrations and the exposure routes since protectiveness may be achieved by reducing exposure as well as by reducing contaminant levels.

The RAOs for the Painesville site are as follows:

- To comply with applicable or relevant and appropriate requirements (ARARs).
- To ensure protection of human health and the environment by reducing exposure by external gamma, inhalation and ingestion to the FUSRAP COCs (Ra-226, Th-230, Th-232, and total U) in site soils.
- To remediate the site so that the following site wide area average Derived Concentration Guideline Levels (DCGLs) are not exceeded: Ra-226 = 9 pCi/g, Th-230 = 25 pCi/g, Th-232 = 6 pCi/g, and Total U = 482 pCi/g.

RAOs are applicable to all media that need to be addressed at the site. The 1996 field effort reported on in the 1998 Characterization Report (USACE, 1998a) found no evidence of AEC related contaminants in the sediments, surface water, or air of the Painesville site. These media are therefore not addressed in the proposed plan. Groundwater was evaluated in the 2003 Remedial Investigation/Feasibility Study Report and found to be currently unimpacted, and protected from migration of radionuclides by the nature and thickness of the soils at the site.

6.2 Applicable or Relevant and Appropriate Requirements

The identification and evaluation of ARARs is an integral part of the remedial process. Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) specifies that remedial actions for cleanup of hazardous substances must comply with requirements or standards under Federal or more stringent state environmental laws that are applicable or relevant and appropriate to the hazardous substances at a site. Protection of human health and the environment is assured by complying with ARARs. The following sections discuss the ARARs for cleanup of the Painesville site.

6.2.1 Introduction to ARARs

Section 121(d)(1) of CERCLA sets requirements with respect to any hazardous substance, pollutant, or contaminant that will remain on-site. Remedial actions must upon completion achieve a level or standard of control which at least attains legally applicable or relevant and appropriate standards, requirements, criteria, or limitations (ARARs) promulgated under Federal environmental law or any more stringent State environmental or facility siting law.

Identifying ARARs involves determining whether a requirement is applicable, and if it is not applicable, then whether a requirement is relevant and appropriate. Individual ARARs for each site must be identified on a site-specific basis. Factors to assist in identifying ARARs include the physical circumstances of the site, contaminants present, and characteristics of the remedial action.

Applicable requirements are defined as those standards, requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that are legally applicable to the hazardous substances, or pollutants or contaminants at the site. A law or regulation is applicable if the jurisdictional prerequisites of the law or regulation are satisfied.

Relevant and appropriate requirements are defined as those standards, requirements, criteria, or limitations promulgated under federal environmental or State environmental or facility siting laws that, while not applicable to a hazardous substance or pollutant or contaminant, are relevant and appropriate under the circumstances of the release or threatened release of the hazardous substance or pollutant or contaminant at the site.

State requirements are ARARs under CERCLA only if they are: (1) promulgated and of general applicability, (2) identified by the state in a timely manner, and (3) more stringent than federal standards.

Determining whether a rule is relevant and appropriate is a two-step process, which involves determining whether the rule is relevant, and, if so, whether it is appropriate. A requirement is relevant if it addresses problems or situations sufficiently similar to the circumstances of the release at the site. It is appropriate if it is well suited to the site.

CERCLA Section 121(e), 42 USC 9621(e), provides that no permit is required for the portion of any removal or remedial action conducted onsite. Although no permit is required, onsite actions must comply with substantive requirements that permits enforce, but not with related administrative and procedural requirements. That is, remedial actions conducted onsite do not require a permit but must be conducted in a manner consistent with permitted conditions as if a permit were required.

A third category of standards, requirements, criteria or limitations is the “To Be Considered” (TBC) category, which includes proposed rules and non-promulgated advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential ARARs. If no other standard is available for a situation to help determine the necessary level of cleanup for protection of health or the environment, a TBC may be included as guidance or justification for a standard used in the remediation, at the discretion of the lead agency.

The USACE has identified Title 10, Part 20, of the Code of Federal Regulations (10 CFR 20), and Chapter 3701:1-38, Rule Number 22, of the Ohio Administrative Code (OAC 3701:1-38-22) as ARARs for the Painesville FUSRAP Site.

6.2.2 Federal ARAR - 10 CFR 20, Subpart E

The Painesville Site is contaminated with radioactive material that is the residuals of ore processing at another site that occurred prior to 1978, when Congress provided the NRC authority to regulate such materials. Generally, the regulations most applicable or relevant and appropriate to ore processing sites with these types of residual materials are 40 CFR 192 and 10 CFR 40, Appendix A. However, these regulations are not applicable or relevant and appropriate here because ore processing did not occur on the Painesville Site, but rather the residuals were inadvertently released on the site as a side effect of the storage and use in the magnesium production process of empty metal containers that had previously been used to transport the residuals. The radiological contamination at the site is from the containers, and not distributed from ore processing. Since the distribution of residuals is not similar to the distribution that

would be expected at an ore processing facility, 40 CFR 192 and 10 CFR 40, Appendix A, are not applicable or relevant and appropriate to the site.

10 CFR 20, Subpart E is applicable to Nuclear Regulatory Commission (NRC) licensed facilities. The regulation establishes standards for the decommissioning of facilities licensed by the NRC to manage special nuclear, source, or byproduct material. The decommissioning standards establish criteria for license termination with unrestricted use, license termination under restricted conditions and allow the submission of alternate criteria for license termination. Under the regulation, a facility is considered to be acceptable for unrestricted use if residual radioactivity exceeding background results in a total effective dose equivalent (TEDE) that does not exceed 25 millirem (mrem) per year to the average member of the critical group, including groundwater sources of drinking water, and must further reduce residual radioactivity to as low as reasonably achievable (ALARA) levels. The critical group is "the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances." A facility will be considered acceptable for restricted use if the levels of residual radioactivity are ALARA, there are legally enforceable land use controls that will assure the TEDE will not exceed 25 mrem per year and will not impose undue burdens on the local community, and if the land use controls fail the TEDE is ALARA but not more than 100 mrem per year. An alternative criteria is acceptable if it is protective of public health and the environment and the dose from all man-made sources combined, except medical, would be no more than 100 mrem per yea. The alternative criteria also must include land use controls and achieve ALARA levels.

The Painesville Site does not have an NRC license. Therefore, 10 CFR 20 Subpart E rule is not applicable to the site. However, USACE has identified 10 CFR 20 Subpart E as an ARAR because it is both relevant to and appropriate for the site. The regulation addresses situations sufficiently similar to the circumstances of the release at the Painesville Site and its use is appropriate to the circumstances of the release. The ore processing residuals from the empty metal containers have caused localized occurrences of uranium or thorium in concentrations that exceed the regulated source material concentration limitation, so that a source material license could have been required for the site. If the site had been licensed for the possession or processing of source material, its decommissioning would be subject to the license decommissioning standards in 10 CFR 20, Subpart E. Additionally, the size and nature of the facilities, the media and the constituents of concern at the Painesville Site are generally the same or similar to those found at the sites subject to this regulation. Therefore, 10 CFR 20, Subpart E, is relevant and appropriate for the Painesville Site.

10 CFR 20, Subpart E, requires identification of the critical group when developing cleanup goals. The Painesville Site has been an industrial site since the early 1940s, and is currently zoned as industrial. The Painesville Site is surrounded by active and inactive industrial properties, including an active

facility, Twin Rivers Technologies, immediately adjacent to the site. Soils at the site are poorly suited for agricultural purposes, as native soils are high in clay content, and a layer of miscellaneous fill exists over much of the site. Groundwater supplies at the site are low in quantity and of low quality for drinking purposes. Finally, the site property owner, Crompton Manufacturing Company, Inc., is conducting chemical cleanup activities at the site and adjacent properties, which include capping of landfills and lagoons, restricting potential future residential development or construction on them. Therefore, the reasonable expected future site use of the Painesville Site is industrial.

The 2003 Remedial Investigation/Feasibility Study Report developed cleanup goals based on an average industrial worker as the critical group. The industrial worker was assumed to spend the majority of time on-site indoors, with limited exposure to the FUSRAP materials in site soils. Since that time, all of the buildings on the site have been demolished, and any future industrial development or use will require construction of new facilities. Based on this, the 2005 Feasibility Study Addendum changed the critical group used to develop cleanup goals to a construction worker. The construction worker is assumed to spend his entire time on-site outdoors, with greater potential exposure to FUSRAP materials than the industrial worker, which results in more stringent cleanup goals.

6.2.3 State ARAR - OAC 3701:1-38-22

A state standard that is promulgated, is identified by the state in a timely manner and is more stringent than federal requirements may be applicable or relevant and appropriate. In addition, the state must consistently apply, or demonstrate the intention to consistently apply, the promulgated requirement in similar circumstances at other remedial actions within the state.

OAC 3701:1-38-22 is a regulation that was promulgated by the State of Ohio to establish standards for the decommissioning of facilities licensed by the state to manage special nuclear, source, or byproduct material. The State of Ohio has the authority to promulgate and enforce such regulations based on an agreement with the NRC that allows the State to regulate such materials in the State of Ohio and the NRC to discontinue such regulation.

OAC 3701:1-38-22 adopts the same required standard for license termination with unrestricted use as 10 CFR 20, Subpart E. A facility is considered to be acceptable for unrestricted use if residual radioactivity exceeding background results in a total effective dose equivalent (TEDE) that does not exceed 25 millirem (mrem) per year to the average member of the critical group, including groundwater sources of drinking water, and must further reduce residual radioactivity to as low as reasonably achievable (ALARA) levels. The critical group is defined in the same way as under 10 CFR 20, Subpart E. However, unlike 10 CFR 20, Subpart E, the regulation does not allow decommissioning with license termination for other than unrestricted use. Instead, if a site is

decommissioned using alternate criteria, a decommissioning possession only license must be maintained on the site.

The Painesville Site is not licensed by the state. Therefore, OAC 3701:1-38-22 is not applicable. However, USACE has identified OAC 3701:1-38-22 as an ARAR because it is both relevant to and appropriate for the site, for the same reasons that 10 CFR 20, Subpart E, is relevant and appropriate. Because a construction worker has been identified as the average member of the critical group, and the cleanup goals have been developed to meet the criteria for unrestricted use for the construction worker, 10 CFR 20, Subpart E, and OAC 3701:1-38-22 are functionally equivalent for the Painesville Site.

6.3 Selected Cleanup Goals

The Painesville site will be remediated and closed in a manner consistent with guidance contained in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (EPA 2000). MARSSIM requires that dose or risk-based standards be converted into equivalent activity concentration values, known as Derived Concentration Guideline Levels (DCGLs). MARSSIM assumes that two types of DCGLs will be applied to a site, a $DCGL_w$ and a $DCGL_{emc}$. The $DCGL_w$ represents a wide area average value that must be attained. The $DCGL_{emc}$ refers to elevated area or "hot spot" criteria. $DCGL_{emc}$ requirements ensure that no localized areas will remain that potentially pose unacceptable risks.

Based on the ARAR analysis, a TEDE goal of 25 mrem/yr was assumed for the site with an construction worker considered as the average member of the critical group. The site-specific RESRAD model described in Section 5.1 was used to back-calculate equivalent $DCGL_w$ requirements for each of the Painesville radiological COCs. The results from this calculation are contained in Table 2. The $DCGL_w$ requirements in Table 2 were derived assuming only one of the radionuclides is present above background levels. Since soils will potentially contain a mix of residual radionuclides once remediation is complete, a Sum of Ratios (SOR) calculation will be used to ensure that the total dose represented by the residual radionuclides is less than the 25 mrem/yr requirement.

The $DCGL_w$ requirements in Table 2 were used to develop the volume estimates for contaminated soils remaining at the Painesville site. In addition to the $DCGL_w$ requirements contained in Table 2, appropriate $DCGL_{emc}$ requirements will be derived for the Painesville site before remediation begins. A detailed Final Status Survey Plan (FSSP) will also be developed prior to the initiation of remediation at the Painesville site. The Final Status Survey Plan will contain the confirmation methodology that will be used to demonstrate compliance with $DCGL_w$ and $DCGL_{emc}$ requirements across the site once remediation is complete.

Table 2: COCs and Soil Cleanup Goals for the Painesville Site

RECEPTOR	COC	BACKGROUND (pCi/g)	CLEANUP GOAL (pCi/g) [a,b]
Construction Worker	Ra-226[c]	1.42	9
	Th-230	2.56	25
	Th-232[d]	1.53	6
	Total U[e]	5.97[f]	482

[a] These cleanup goals represent activity levels above site background activity corresponding to 25 mrem/yr. These cleanup goals are equivalent to an incremental lifetime cancer risk of approximately 2E-05 for a construction worker (for each COC).

[b] If a mixture of radionuclides is present, then the sum of ratios applies per MARSSIM. For example, using the unrestricted land use cleanup goals for soil, the following sum of ratios equation is obtained:

$$SOR = \frac{Ra-226}{9} + \frac{Th-230}{25} + \frac{Th-232}{6} + \frac{U-234 + U-235 + U-238}{482}$$

where SOR = sum of the ratios result
Ra-226 = net Ra-226 soil concentrations
Th-230 = net Th-230 soil concentrations
Th-232 = net Th-232 soil concentrations
U-234 = net U-234 soil concentrations
U-235 = net U-235 soil concentrations
U-238 = net U-238 soil concentrations
Net soil concentrations exclude background.

[c] Ra-226 criteria includes Pb-210 contribution to dose.
[d] Th-232 criteria includes Th-228 and Ra-228 contribution to dose.
[e] Concentration represents the total uranium guideline.
[f] Total uranium background is the sum of the background values for U-234, U-235 and U-238.

7.0 SUMMARY OF REMEDIAL ALTERNATIVES

This section summarizes remedial alternatives developed in the Feasibility Study for the Painesville site. The remedial alternatives were constructed by combining general response actions, technology types and process options. Remedial alternatives should assure adequate protection of human health and the environment, achieve RAOs, meet ARARs, and permanently and significantly reduce the volume, toxicity, and/or mobility of site-related contaminants.

The remedial alternatives presented in the Feasibility Study address soil contamination at the Painesville site. The 2003 Remedial Investigation/Feasibility Study Report presented four remedial alternatives to address soil contamination at the Painesville Site. The 2005 Feasibility Study Addendum amended this to three remedial alternatives, for consideration in this Proposed Plan. The alternatives encompass a range of potential actions, and include:

- Alternative 1: No Action
- Alternative 2: Capping in Place
- Alternative 3: Excavation of Soils and Offsite Disposal

Alternative 1 is the no-action response required under the NCP. Alternative 2 utilizes containment technologies in combination with short-term monitoring. Long-term monitoring and maintenance will also be required for Alternative 2, to ensure the effectiveness of the cap. Alternative 3 utilizes removal technologies in combination with short-term monitoring.

7.1 Alternative 1: No Action

Under the no action alternative, no additional remedial action would be taken at the Painesville site.

This alternative is included to provide a baseline for evaluation of other alternatives in accordance with the NCP and CERCLA requirements. The acceptability of the no action alternative will be determined in relation to the assessment of known site risks and by comparison to other remedial alternatives.

7.2 Alternative 2: Capping in Place

This alternative combines the installation of a protective cap with environmental monitoring. Impacted soil exceeding the preliminary remediation goals would be covered in-place by an appropriately designed cap. Any regular capping material would serve since the primary purpose is to block an exposure pathway (the Feasibility Study assumed a one-foot thick asphalt cap for cost estimating purposes). The cap(s) would function as a barrier to reduce potential radiation exposure to site workers and the public. In addition, the cap(s) would restrict the migration of contaminants through dispersion and though transport by infiltrating rainwater. Inspections and maintenance of the cap(s) and environmental

monitoring would continue following implementation of the remedial action to mitigate potential exposures in the long-term.

7.3 Alternative 3: Excavation of Soils and Offsite Disposal

This alternative involves the excavation of impacted soil exceeding a construction worker SOR of 1, off-site transportation, and disposal of the soil at a commercial facility licensed and/or permitted to accept radiological waste. The estimated volume of soil to be excavated is 4,075 cy. Dust suppression and erosion control measures would be implemented as needed during the remedial action to protect the workers and minimize airborne migration of radionuclides. Site access restrictions and environmental monitoring (air and surface water) would be maintained throughout the remedial action. Excavated areas would be backfilled with clean soil, graded, and re-vegetated. Following completion of the remedial action, the site would meet the requirements for unrestricted release.

8.0 EVALUATION OF REMEDIAL ALTERNATIVES

Section 300.430 (e) of the NCP lists nine criteria by which each remedial alternative must be assessed. The acceptability and performance of each alternative against the criteria is evaluated individually so that relative strengths and weaknesses may be identified. Also, a comparative analysis among the alternatives is performed, to identify the advantages and disadvantages of each alternative relative to one another. Assessments against two of the criteria (Overall Protection of Human Health and the Environment and Compliance with Applicable or Relevant and Appropriate Requirements) relate directly to statutory findings and therefore are categorized as threshold criteria. The threshold criteria must be satisfied in order for an alternative to be eligible for selection. Five of the criteria (Long-term Effectiveness and Permanence, Reduction of Toxicity, Mobility, or Volume through Treatment, Short-term Effectiveness, Implementability, and Cost) represent the primary criteria upon which the analysis is based. These balancing criteria are used to weigh major tradeoffs among alternatives. In addition CERCLA Section 121 sets forth requirements for remedial action including the preference for treatment which reduces volume, toxicity or mobility. The remaining two criteria, state acceptance and community acceptance, are categorized as modifying criteria. The modifying criteria are evaluated following comments on the Proposed Plan and will be addressed in the responsiveness summary of the Record of Decision (ROD). The nine criteria are briefly defined as follows:

- **Overall Protection of Human Health and the Environment** addresses whether or not a remedy provides adequate protection and describes how exposure to the hazardous substances released at the site is eliminated, reduced, or controlled through treatment, engineering controls, or land-use controls.
- **Compliance with Applicable or Relevant and Appropriate Requirements** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of Federal and State environmental statutes and/or provide grounds for invoking a waiver.
- **Long-term Effectiveness and Permanence** refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once the cleanup goals have been met.
- **Reduction of Toxicity, Mobility, or Volume through Treatment** is the anticipated performance of the treatment technologies that may be employed in a remedy.
- **Short-term Effectiveness** refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.
- **Cost** includes capital, and operation and maintenance costs.
- **State Acceptance** indicates whether, based on its review of the Remedial Investigation/Feasibility Study and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.
- **Community Acceptance** is assessed following a review of the public comments received on the Proposed Plan.

This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to other options under consideration. The detailed analysis of alternatives can be found in the Remedial Investigation/Feasibility Study Report (USACE 2003). Table 3 presents a summary of the remedial alternative evaluation, and Table 4 presents a comparative analysis of the alternatives.

8.1 Overall Protection of Human Health and the Environment

The no action alternative does not provide adequate protection of human health and the environment. The no action alternative does not include any actions and consequently is not expected to provide protection of human health and the environment against potential exposure to soil contaminated with radionuclides.

Alternative 2 provides good protection of human health and the environment, through the containment of soil contaminated with radionuclides and the reduction of exposure pathways. The alternative would provide shielding to reduce radiation exposures minimizing the potential risks to onsite workers and the public. However, the COCs would remain within the boundaries of the Painesville site and a failure in the containment controls might pose risks to human health and the environment surrounding the facility. A potential for future impacts to human health and the environment exists in the event of a failure in the containment controls.

Alternative 3 provides the best protection of human health and the environment for the site because the impacted soil, that could cause a dose to a construction worker exceeding the ARAR, would be removed from its present location and transported to an off-site facility for disposal. The selected disposal facility will be a licensed/permitted facility.

8.2 Compliance with ARARs

Alternative 1, no action, would not meet the 10 CFR 20 Subpart E and OAC 3701-1-38 cleanup criteria (residual dose of 25 mrem/yr to an industrial worker) proposed by USACE to address radionuclide contamination in soil at the Painesville site.

Alternative 2, capping of contaminated soils in-place, would comply with ARARs. Impacted materials exceeding the cleanup goals would be capped, minimizing the exposure to the COCs in soil. This alternative would reduce the residual dose below the guideline of 25 mrem/yr. The capped areas would require long-term monitoring and maintenance to ensure the protectiveness of the alternative.

Alternative 3, excavation and disposal, would comply with ARARs. Impacted materials exceeding the cleanup goals would be removed from Areas A, B, C, D, G, and the rubble pile and disposed of at a licensed and/or permitted off-site disposal facility. It is anticipated that this alternative would reduce the residual dose below the guideline of 25 mrem/yr for the construction worker critical group.

8.3 Long-Term Effectiveness and Permanence

Among the alternatives, Alternative 3 provides the best long-term effectiveness and permanence. Impacted soil exceeding a construction worker SOR of 1 would be excavated and removed from the Painesville site. At the completion of this alternative the soil within the site would contain radionuclide concentrations below the cleanup goals.

Alternative 2 would be less effective than Alternative 3. This alternative would eliminate the pathways to the contamination, however, the radionuclides would remain within the boundaries of the Painesville site. After the completion of this alternative, long-term monitoring and maintenance would be required to protect the integrity of the cap. If the maintenance activities are not maintained, the goal of long-term effectiveness cannot be assured.

Alternative 1 is not effective since no actions are implemented under this alternative.

8.4 Reduction of Toxicity, Mobility or Volume through Treatment

The No Action alternative would have no effect on the toxicity, mobility, or volume of the contaminant.

None of the other alternatives use treatment to reduce toxicity, mobility or volume of the contaminants. Treatment technologies were considered in the Feasibility Study, however, they were screened out as either ineffective, difficult to implement, or not cost efficient for the contaminants at the Painesville Site.

8.5 Short-Term Effectiveness

Alternative 1 does not present any risk to the community, environment, or site workers during its implementation since no actions are associated with this alternative.

Alternative 2, (capping of contaminated soils in-place) requires minimal intrusive activities, therefore, no significant short-term risks to onsite workers, the community, or the environment are expected during the implementation of this

alternative. During site preparation and cap installation activities, risks to onsite workers from soil contaminated with radionuclides would be mitigated and addressed in a health and safety plan.

Environmental risks to onsite workers, the community, and the environment during the implementation of Alternative 3 may occur due to the operation of heavy equipment, on-site excavation, and construction activities. Disturbed areas would be more likely to experience wind and water erosion. These temporary effects could be minimized by limiting the area disturbed at any time during excavation operations and by employing good engineering practices (e.g., sediment barriers to minimize the amount of sediment leaving the work area and containment of surface water during storms). In addition, this alternative would create an added risk to the community due to the transportation of contaminated soil on public roads or on railroads.

With the exception of the long-term monitoring and maintenance component of Alternative 2, all alternatives are anticipated to take less than one year to implement.

8.6 Implementability

The No Action alternative would be the easiest to implement since it involves no remedial actions. Between the two remaining alternatives, Alternative 3 would be the next easiest to implement. This alternative requires the use of common equipment, materials, and supplies. Excavation, compaction, grading, and revegetation equipment and vendors are readily available. In addition, no special construction or excavation techniques are required. No administrative feasibility issues are anticipated with respect to the commercial disposal of the impacted soil generated under this alternative.

Alternative 2 would not be difficult to implement. The materials necessary to complete this alternative are readily available and vendors could be easily secured. In addition, no special construction or excavation techniques are required. Periodic inspection and maintenance and environmental monitoring would be required following completion of this alternative to ensure protection of human health and the environment.

8.7 Cost

The No Action alternative has no cost since it involves no remedial actions. Alternative 3 has the highest estimated cost, at a present worth cost of $5,297,000. Alternative 2 has the lowest estimated cost to complete, with a present worth cost of $2,606,000. The disposal alternative assumes disposal at a RCRA hazardous waste landfill where the State permit allows the radiological substances to be disposed.

8.8 State Acceptance

The primary state agencies supporting this investigation are the Ohio Environmental Protection Agency (Ohio EPA) and the Ohio Department of Health (ODH). Comments will be accepted from state agencies on the Proposed Plan. This criterion will be addressed in the responsiveness summary of the Record of Decision.

8.9 Community Acceptance

Comments will be accepted from the community on the Proposed Plan. This criterion will be addressed in the responsiveness summary of the Record of Decision.

Table 3: Summary of Remedial Alternative Evaluation

Criteria	Alternative 1: No Action	Alternative 2: Capping in Place	Alternative 3: Excavation and Disposal
Protection of Human Health and the Environment	Does not reduce risks to human health or the environment.	Provides protection of human health and the environment.	Provides protection of human health and the environment.
Compliance with ARARs	Does not satisfy ARARs.	Satisfies ARARs.	Satisfies ARARs.
Long-Term Effectiveness and Permanence	Does not provide long-term effectiveness or permanence.	Environmental monitoring and maintenance of the caps are required to provide long-term effectiveness.	Effective and permanent as soils above the cleanup goals are removed from the site.
Reduction of Toxicity, Mobility and/or Volume Through Treatment	Does not reduce contaminants' toxicity, mobility or volume.	No treatment.	No treatment.
Short-Term Effectiveness	No short-term risk to remedial workers, the community or the environment since no remedial actions are implemented.	Minimal risk to remedial workers. Negligible risk to community and environment due to limited intrusive activities.	Risk to workers would be mitigated through a health and safety plan. Risk to community and environment would be mitigated through engineering controls.
Implementability	There are no technical or administrative implementability issues.	There are no technical implementability issues; services and materials are readily available.	There are no technical implementability issues; services and materials are readily available.
Cost (Discounted 7%)	$0	$2,606,000	$5,297,000
State Accept	TBE	TBE	TBE
Community Accept	TBE	TBE	TBE

TBE = To be evaluated after review of the Proposed Plan.

Table 4: Comparative Analysis of Remedial Alternatives

Criteria	Alternative 1: No Action	Alternative 2: Capping in Place	Alternative 3: Excavation and Disposal
Protection of Human Health and the Environment	No	Yes	Yes
Compliance with ARARs	No	Yes	Yes
Long-Term Effectiveness and Permanence	Low	Medium	High
Reduction of Toxicity, Mobility and/or Volume	Low	Low	Low
Short-Term Effectiveness	High	High	Medium
Implementability	High	Medium	Medium
Cost (Discounted 7%)	$0	$2,606,000	$5,297,000
State Accept	TBE	TBE	TBE
Community Accept	TBE	TBE	TBE

TBE = To be evaluated after review of the Proposed Plan.

9.0 PREFERRED ALTERNATIVE

USACE prefers Alternative 3, Excavation of Soils and Offsite Disposal, to address impacted soils. All on-site soils exceeding the construction worker cleanup goals will be excavated and shipped off site for disposal at a licensed/permitted disposal facility. Alternative 3 is considered to be the most protective in the long term and is permanent because all soils exceeding the construction worker cleanup goals will be removed from the Painesville Site. Alternative 3 ensures compliance with the ARARs, since all of the materials exceeding the cleanup goals are removed from the Painesville site. Cleanup goals will be used as target concentrations (e.g., 95% upper confidence limit of the mean) of the COCs that may remain. In addition, not to exceed concentrations will be developed to ensure no localized areas remain potentially posing unacceptable risk. MARSSIM will be used, as appropriate, to determine if the RAOs have been met.

Alternative 2 would comply with ARARs, but is not as protective since all of the contaminated material would remain on site, although the cap would prevent human exposure. Alternative 2 is also not as effective in the long term or as permanent, as it requires maintenance of the cap and environmental monitoring to ensure its protectiveness.

Alternative 1 is not compliant with ARARs, and thus, is not consistent with the threshold criteria of CERCLA, which requires compliance with ARARs. Accordingly, Alternative 3 is preferred by USACE for the impacted soils at the Painesville site.

USACE expects the preferred alternative to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions that will preclude any future environmental impact to the environment or the groundwater system. Implementation of the preferred alternative will allow release of the site for industrial use in a reasonable period of time. Release of the Painesville site would only be with respect to the FUSRAP-related materials associated with the radiologically contaminated scrap steel used in magnesium production by the former Diamond Magnesium Company.

10.0 COMMUNITY ROLE IN SELECTION PROCESS

Public input is encouraged by USACE and no final decision will be made on a remedy until all comments are considered.

The Administrative Record contains all documentation used to support the preferred remedy, and is available at the following locations:

USACE FUSRAP Public Information Center
1776 Niagara Street
Buffalo, NY 14207
(716) 879-4396
(800) 833-6390 and press "5" at the recorded message.

Fairport Public Library
335 Vine Street
Fairport Harbor, OH 44077
(440) 354-8191

Morley Library
184 Phelps Street
Painesville, OH 44077
(440) 352-3383

The public is encouraged to review and comment on all alternatives described in this Proposed Plan and the supporting Feasibility Study and Remediation Investigation.

Comments on the proposed remedial action at the Painesville site will be accepted for 30 days following issuance of the Proposed Plan in accordance with CERCLA, as amended, and the NCP. A public meeting will be held during the comment period to receive any verbal comments the public wishes to make. Written comments the public wishes to submit regarding the preferred remedy will be received at the meeting or during the 30-day period. Responses to the public comments will be presented in a response to comments in the Record of Decision, which will document the final remedy selected for the Painesville site.

All written comments should be addressed to:

U.S. Army Corps of Engineers
Buffalo District
FUSRAP Information Center
1776 Niagara Street
Buffalo, NY 14207

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